

## Claims

1. A method of location management in a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network,

characterized in that

a plurality of location areas and a reporting area comprising at  
10 least one location area are defined,

the radio access network tracks the mobile station with an accuracy of one location area, and

the radio access network reports to the core network the changes in location with an accuracy of one reporting area.

15 2. A method according to claim 1, c h a r a c t e r i z e d in that a plurality of location accuracy levels is defined, each location accuracy level having location areas of different sizes, and the radio access network selects one of these accuracy levels to be used for tracking the mobile station.

3. A method according to claim 2, characterized in that  
20 the reporting area is a location area of one location accuracy level.

4. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on the services the mobile subscriber is currently using.

25 5. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on service parameters given by the core network.

6. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on the past behavior of the mobile subscriber.

30 7. A method according to claim 6, characterized in that the behavior of the mobile subscriber is determined based on the number of pages the radio access network has performed to locate the mobile station and the number of location updates the mobile station has performed.

8. A method according to claim 2, characterized in that  
35 the radio access network informs the mobile station of the location accuracy  
level to be used when tracking the mobile station.

10. A method according to claim 1, characterized in that  
5 the mobile station is entitled to different services in different reporting areas.

12. A method according to claim 1, c h a r a c t e r i z e d in that  
10 the core network and the radio access network negotiate the size of the re-  
porting area to be used.

14. A method according to claim 12, characterized in  
15 that the negotiation takes place when the service is in an activated state.

20 the mobile station of the subscriber initiates a location update pro-  
cedure when entering into a new reporting area,

25 the core network receives the new location information and defines the new service area of the subscriber, checks the service parameters of services the mobile subscriber is entitled to in the new service area, and sends the radio access network information about the new service parameters.

16. A method according to claim 1, characterized in that information about service area configuration is stored in the mobile station, and when entering a new service area, the mobile station initiates a location update procedure, instructing the radio access network to

the radio access network forwards the location information to the core network.

18. A method according to claim 16, characterized in that the information about the service area configuration is given as coordinates of the service area and the mobile station observes its coordinates and initiates a location update when entering into a new service area.

characterized in that the network element is adapted to store information concerning a plurality of location areas and a reporting area comprising at least one location area,

20. A network element as defined in claim 19, c h a r a c t e r - i z e d in that the network element is in addition adapted to negotiate the size of the reporting area with the core network.

characterized in that the radio access network is adapted to

35 store information concerning a plurality of location areas and a re-  
reporting area comprising at least one location area.

reporting to the core network the changes in location with an accuracy of one reporting area.

23. A radio access network for a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network on the accuracy of one location area and in the core network on the accuracy of one service area.

20 24. A core network as defined in claim 23, characterized  
in that the network element is in addition adapted to negotiate the size of the  
reporting area with the radio access network.

30 characterized in that the mobile station is adapted to  
store information about the service areas of the subscriber, and  
when entering a new service area, to

initiate a location update procedure and to instruct the radio access network to forward the new location information to the core network.

## Claims

2. A method of location management in a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning a location of a mobile station is stored in the radio access system, characterized in that

the radio access system uses a location area configuration to track the location of the mobile station on the accuracy of one location area,

determining in the core network a service area comprising at least one location area,

informing the radio access network of the service area determined,

receiving by the radio access network a location update from a mobile station,

15 determining based on the location update whether or not the mobile  
station has exceeded the border of the service area, and

claim 21:  
sending the core network a report if the mobile station has exceeded the border.

Claim 26

20 21 A method according to claim 1, wherein a plurality of location accuracy levels is defined, each location accuracy level having location areas of different sizes, and the radio access network selects one of these accuracy levels to be used for tracking the mobile station.

23 A method according to claim 2, wherein the reporting area is a lo-  
 cation area of one location accuracy level.

24. A method according to claim 23, wherein the radio access network selects the location accuracy level based on the services the mobile subscriber is currently using.

30 A method according to claim 2, wherein the radio access network selects the location accuracy level based on service parameters given by the core network.

3i) A method according to claim 2, wherein the radio access network selects the location accuracy level based on the past behavior of the mobile subscriber.

32 A method according to claim 5, wherein the behavior of the mobile  
35 subscriber is determined based on the number of pages that the radio ac-



information about service area configuration is stored in the mobile station, and when entering a new service area, the mobile station initiates a location update procedure, instructing the radio access network to forward the new location information to the core network, and

5 the radio access network forwards the location information to the core network.

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42 A method according to claim ~~15~~<sup>41</sup>, wherein the information about the service area configuration is given as a list of cells.

43 A method according to claim ~~15~~<sup>41</sup>, wherein the information about the service area configuration is given as coordinates of the service area and the mobile station observes its coordinates and initiates a location update when entering into a new service area.

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cont  
44 A radio access network for a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access system, characterized in that the radio access system is adapted to

20 use a location area configuration to track the location of the mobile station on the accuracy of one location area,

receive information on a service area determined,

receive a location update from a mobile station,

25 determine, based on the location update, whether or not the mobile station has exceeded the border of the service area, and

send the core network a report if the mobile station has exceeded the border.

45 A network element for a radio access network of a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access system,

30 characterized in that the network element is adapted to

35 use a location area configuration to track the location of the mobile station on the accuracy of one location area,

receive information on a service area determined,  
receive a location update from a mobile station,  
determine, based on the location update, whether or not the mobile  
station has exceeded the border of the service area, and  
5 send the core network a report if the mobile station has exceeded  
the border.

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*cont*  
10 ~~46~~ A core network for a mobile telecommunication system compris-  
ing mobile subscribers, their mobile stations, at least one core network pro-  
viding telecommunication services, and a radio access network providing  
connections between the mobile stations and the core network, and in which  
system information concerning the location of the mobile station is stored in  
the radio access system, and the radio access system uses a location area  
configuration to track the location of the mobile station on the accuracy of  
one location area,

15 characterized in that the core network is adapted to  
determine a service area comprising at least one location area,  
inform the radio access network of the service area determined, to  
receive a report from the radio access system when the mobile sta-  
tion has exceeded the border of the reporting area.  
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